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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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|-----------------|-------------|----------------------|---------------------|------------------|

10/619,348

07/14/2003

Daoqiang Lu

Intel/16653

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34431

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01/18/2006

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EXAMINER

WILSON, CHRISTIAN D

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/619,348

Applicant(s)

LU, DAOQIANG

Examiner

Christian Wilson

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 and 25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 2, 4, 5 and 7 – 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Jiang *et al.*

Jiang *et al.* (US 6,610,591) discloses a method to control the distance between a chip die **20** and a substrate **10** by coupling a spacer **40** to the chip die where the spacer has a length and a melting point which is greater than solder [column 7, lines 5-10], and bonding the chip to the substrate without melting the spacer [column 7, lines 40-45] where the spacer length determines the distance between the chip and substrate [column 7, line 26].

Regarding claim 2, Jiang *et al.* further discloses a ball spacer [Figure 3B].

Regarding claim 4, Jiang *et al.* further discloses a spacer with a core **42** and a solder covering **44**.

Regarding claim 5, Jiang *et al.* further discloses a flip chip die [column 1, line 30].

Regarding claims 7 and 8, Jiang *et al.* further discloses a conductive pad **18** which is a solder pad [Figure 3A].

Regarding claims 9 and 10, Jiang *et al.* further discloses forming a solder joint to create an electrical connection [Figure 4].

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang *et al.* in view of Chang *et al.*

Jiang *et al.* teaches a round spacer. Chang *et al.* (US 5,431,328) teaches a spacer with a flattened surface [Figure 1]. It would have been obvious to one of ordinary skill in the art to use the flattened spacer of Chang *et al.* in the method of Jiang *et al.* since this provides a bond which is not easily shortened during bonding and doesn't easily crack after reflow.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang *et al.* in view of Miller *et al.*

Jiang *et al.* teaches coupling a varied group of chips to substrates, but does not discuss coupling an optical element. Miller *et al.* (US 6,759,687) teaches optically coupling an optical element 44 to a waveguide 52. It would have been obvious to one of ordinary skill in the art to use the bonding method of Jiang *et al.* in the coupling method of Miller *et al.* since the method of Jiang *et al.* would provide a uniform height connection while eliminating the need for additional solder or solder flux. [column 5, lines 20-25].

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6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang *et al.* in view of Reedy *et al.*

Jiang *et al.* teaches bonding the chip to the substrate, but does not describe using a thermocompression method. Reedy *et al.* (US 6,583,445) teaches a thermocompression method [column 13, lines 40-55]. It would have been obvious to one of ordinary skill in the art to use thermocompression in the method of Jiang *et al.* since thermocompression is well known in the art for bonding flip chip devices.

7. Claims 12 – 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang *et al.* in view of Miller *et al.* and Reedy *et al.*

Jiang *et al.* teaches a method to control the distance between a chip die **20** and a substrate **10** by coupling a spacer **40** to the chip die where the spacer has a length and a melting point which is greater than solder [column 7, lines 5-10], and bonding the chip to the substrate without melting the spacer [column 7, lines 40-45] where the spacer length determines the distance between the chip and substrate [column 7, line 26]. Jiang *et al.* does not discuss coupling an optical flip chip to an optical waveguide using thermocompression. Miller *et al.* teaches optically coupling an optical element **44** to a waveguide **52**. Reedy *et al.* teaches a thermocompression method [column 13, lines 40-55]. It would have been obvious to one of ordinary skill in the art to use the bonding method of Jiang *et al.* with a thermocompression method in the coupling method of Miller *et al.* since the method of Jiang *et al.* would provide a uniform height connection while eliminating the need for additional solder or solder flux [column 5, lines 20-25] and thermocompression is well known in the art for bonding flip chip devices.

Regarding claim 13, Jiang *et al.* further discloses a ball spacer [Figure 3B].

Regarding claim 14, Miller *et al.* further teaches maximizing the optical coupling between the optical flip chip and the optical waveguide [column 2, lines 5-10]. It would have been obvious to one of ordinary skill in the art to use the method of Miller *et al.* in the coupling method of Jiang *et al.* since this provides an optimal operation of the final device.

Regarding claims 15 and 16, Jiang *et al.* further teaches a spacer with a core 42 and a solder covering 44 where the core has a higher melting point than the covering [column 7, lines 5-10].

Regarding claim 17, Jiang *et al.* further teaches forming an electrical connection with a solder joint [Figure 4].

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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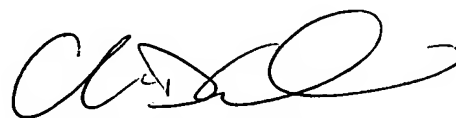
however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian Wilson whose telephone number is (571) 272-1886.

The examiner can normally be reached on weekdays, 7:30 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christian Wilson, Ph.D.  
Primary Examiner  
Art Unit 2891

CDW